

NASA's Center of Excellence for Collaborative Innovation (CoECI)
and the Harvard-NASA Tournament Lab - **The Future Is Now:
Challenge-Driven Open Innovation in the Federal Government**

..... *Lessons Learned*

- The NASA Longeron Challenge; William Spetch, NASA	p2
- The NITRD Big Data Challenge; Susanne Iacono, NSF	p4
- My Air, My Health; Denice Shaw, EPA	p6
- The Medicare Provider Portal Screening Challenge; John (Chip) Garner, CMS	p9
- The Tech Challenge for Atrocity Prevention; Maurice Kent and Mark Goldenbaum, USAID	p12

The NASA Longeron Challenge; William Spetch, NASA

1. Please describe your challenge
 - a. What was the challenge?
The ISS Longeron Challenge trying to optimize power generation at high solar beta angles.
 - b. Why did you select a challenge to solve your problem?
We were approached by NASA Headquarters looking for problems that could be used as a challenge potentially. In this case we had a solution already that was working but took the opportunity to see if it could be improved upon.
 - c. What problem solving mechanisms had you already tried and for how long?
We had iterated on the problem and developed a solution prior to the challenge.
 - d. Were there other mechanisms you used to try to solve the problem first? - See Above
 - e. What would have been the traditional method you would have used to achieve your goal? - See Above
2. Describe the internal approval process for running the challenge
 - a. What did it take to gain approval?
In this case only a quick conversation with my management
 - b. How did you obtain funding?
It was provided by Headquarters as a proof of concept type challenge.
 - c. Were there any obstacles to running the challenge and how did you overcome them? - None programmatically
3. What processes/operational procedures did you put in place to run the challenge?
 - a. What resources did you use to execute? If possible, could you break it down into the following phases:
 - i. Pre-Competition (e.g., problem definition and challenge design)
Significant effort had to be placed into developing this challenge. Since we were looking to optimize an engineering problem using individuals with no experience in power generation or structural loads the first step was developing simplified modeling methodology and parameters. Significant thought had to be put into how aspects of the problem would be scored because there were other considerations needed other than just the final power generation values. The majority of the pre-contest development work was handled by TopCoder but I drew on my engineering support teams to develop the algorithm's needed for power generation, structural loads and joint rotations. Overall, it took almost a year to get the challenge off the ground.
 - ii. Competition (Launch & marketing, contest/challenge support)
The launch and marketing of the contest was fairly simple from my end. I participated in an online interview and reviewed the contest forums to help answer some of the questions asked by contestants. We also ran a t-shirt design competition which created some great buzz for the competition.

- iii. Evaluation (judging and selection of winners) – We developed a scoring algorithm to evaluate the winners that was fairly simple based on power generation and joint rotations.
- iv. Post-Competition (Solver verification and implementation)
This required some effort beyond what we expected once the results came back. WE ran the solutions from the contest through our detailed power generation models and noticed some significant differences. There were a lot of questions regarding the final values and what they represented. Looking back we should have ironed this part out more before the contest began.

4. Describe the outcomes of the challenge:

- a. What product did you receive?
We received a huge response to the challenge. We looked at the top 20 finishers and received the solar array angles that they provided into the contest. While the detailed power analysis was not better than our current implementation the solutions give us ideas for the future if issues arise with some of our solar arrays.
- b. What are you doing, or do you plan to do, with the result of the challenge?
We are keeping it for the future in case of degradation of solar array joints on the ISS.
- c. If the result was not what you expected, what factors contributed to the result?
The results were not exactly what we expected but looking back on the parameters we gave the contestants they made sense. We provided penalties if certain inputs were used (mainly total joint rotation) that we did not have when we originally solved the problem. This lead to interesting results that were still close to our current capabilities.
- d. Is there anything you learned, that you wish you had known before running the challenge?
Having a proper set to goals and requirements set prior to engaging in a challenge is important. The challenge was not initially defined well by me so it took more time upfront to explain what was required and therefore delayed the final result.
- e. Would you run a challenge again?
I Hope to run another challenge in the near future.

5. What value did you receive from the challenge(s)?

We received insight into other options to approach a problem should certain contingencies occur on the ISS,

6. What surprised you about the process?

The difficulty in developing a modeling and scoring architecture.

7. Now that you've done this, what is the level of buy-in within your organization?

- a. How does this not become a one-off effort?
We are approaching the ISS Program with the idea of performing a second challenge in the next two months.
- b. Can this become a routinized procurement strategy?
Hard to say at this point.

8. Any final comments?

The NITRD Big Data Challenge; Susanne Iacono, NSF

1. Please describe your challenge
 - a. What was the challenge?
 - i. [BigData Challenge](#)
 - ii. [Mozilla Ignite Challenge](#)
 - b. Why did you select a challenge to solve your problem?
 - i. [Want to involve other communities](#)
 - ii. [Specifically, wanted to include the open source development community](#)
 - c. What problem solving mechanisms had you already tried and for how long?
 - i. [Still doing regular grants; challenges are new](#)
 - ii. [Still doing regular grants; challenges are new and beyond what we are currently doing](#)
 - d. Were there other mechanisms you used to try to solve the problem first?
 - e. What would have been the traditional method you would have used to achieve your goal?
2. Describe the internal approval process for running the challenge
 - a. What did it take to gain approval?
 - i. [Included the policy and legal offices in deciding how to implement our challenge](#)
 - b. How did you obtain funding?
 - i. [BigDATA program funds](#)
 - ii. [US Ignite program funds](#)
 - c. Were there any obstacles to running the challenge and how did you overcome them?
 - i. [The choice of platform for BigData ended up not being the best. Will choose another platform next time.](#)
3. What processes/operational procedures did you put in place to run the challenge?
 - a. What resources did you use to execute? If possible, could you break it down into the following phases:
 - i. Pre-Competition (e.g., problem definition and challenge design)
 1. [We worked with NASA Center of Excellence](#)
 2. [We gave a cooperative agreement to Mozilla Foundation.](#)
 - ii. Competition (Launch & marketing, contest/challenge support)
 1. [The Top Coder people worked with us.](#)
 2. [The Mozilla Foundation staff worked with us.](#)
 - iii. Evaluation (judging and selection of winners)
 1. [Judges did the evaluation](#)
 2. [Judges and mentors and staff led the teams over a several month process](#)
 - iv. Post-Competition (Solver verification and implementation)
 1. [Announcements will be made.](#)
 2. [Announcements were made at the US Ignite Summit in Chicago in June; press releases went out.](#)

4. Describe the outcomes of the challenge:
 - a. What product did you receive?
 - i. Some BigDATA ideas
 - ii. Ideas plus real prototype systems for gigabit apps using gigabit networks
 - b. What are you doing, or do you plan to do, with the result of the challenge?
 - i. Do another one.
 - ii. We are moving to the next phase; matching people with app ideas with anchor institutions willing to try them out; will use the "hive guy" model.
 - c. If the result was not what you expected, what factors contributed to the result?
 - i. The ideation challenge didn't fit top coder's population and how they work; the prizes were too small.
 - d. Is there anything you learned, that you wish you had known before running the challenge?
 - i. Lots of things; need platform and goals to match.
 - ii. Mozilla did a great job; it took much longer to get it going.
 - e. Would you run a challenge again?
 - i. Yes
 - ii. Yes
5. What value did you receive from the challenge(s)?
 - a. Press
 - b. Press/excitement about the new ideas; new people brought to the table
6. What surprised you about the process?
 - a. How exacting and long it takes
 - b. Ditto
7. Now that you've done this, what is the level of buy-in within your organization? Pretty good!
 - a. How does this not become a one-off effort?
 - i. Will keep pluggin away
 - ii. Need to get more going and get a group at NSF.
 - b. Can this become a routinized procurement strategy?
 - i. This is instead of grants, not procurement.
8. Any final comments?

My Air, My Health; Denise Shaw, EPA

1. Please describe your challenge
 - a. What was the challenge?

The EPA/HHS "My Air, My Health Challenge" was a multidisciplinary call to innovators and software developers ("Solvers") to enable near-real-time, location-specific monitoring and reporting of air pollutants and potentially related physiological parameters, using a personal/ portable integrated system to assess connections between the two ("sensor systems").
 - b. Why did you select a challenge to solve your problem?

We wanted to raise general awareness for an important gap in scientific understanding and personal knowledge of air quality. We also hoped to stimulate interest and research in the emerging field of low-cost, portable, real-time sensors.
 - c. What problem solving mechanisms had you already tried and for how long?

Although there had been excellent research in characterizing both air quality and human health and the effect of air quality on human health there had not been a lot of research to support the simultaneous monitoring of air quality and corresponding health responses in real time.
 - d. Were there other mechanisms you used to try to solve the problem first?
 - e. What would have been the traditional method you would have used to achieve your goal?

Research grants and government research labs, both of which are quality options. However, the sensor field is advancing rapidly, and we wanted to tap into ingenuity of American problem solvers and do so on a shorter timeframe than traditional methods.
2. Describe the internal approval process for running the challenge
 - a. What did it take to gain approval?

We needed extensive review by both EPA and HHS senior management. In EPA specifically, all challenges must pass a ChART review.
 - b. How did you obtain funding?
 - c. Were there any obstacles to running the challenge and how did you overcome them?
3. What processes/operational procedures did you put in place to run the challenge?
 - a. What resources did you use to execute? If possible, could you break it down into the following phases:
 - i. Pre-Competition (e.g., problem definition and challenge design)

EPA and HHS workgroups lead the pre-competition section with support from InnoCentive.
 - ii. Competition (Launch & marketing, contest/challenge support)

Marketing and communication was handled largely by the Agencies through various communication media and events including a Webinar. InnoCentive and Health2.0 also supported launch and marketing. We announced the challenge at the HHS Datapalooza in June 2012, and circled back with the event to announce the winner in June 2013.

iii. Evaluation (judging and selection of winners)

The agencies worked with InnoCentive and a panel of academics and researchers to review the submissions and conduct the evaluations. The Agencies ultimately identified the winners.

iv. Post-Competition (Solver verification and implementation)

We continue to stay in touch with all of our finalist teams, as each had a strength in their submissions. Our winners are working on their next prototype and have been invited to speak at several conferences.

4. Describe the outcomes of the challenge:

a. What product did you receive?

The Agencies don't "receive" anything in the form of a tangible prototype. What we do have is more connections in the sensors sector and the knowledge that we have pushed the thinking in this area so private companies consider the possibilities and outcomes of personal air quality.

b. What are you doing, or do you plan to do, with the result of the challenge?

The Agencies have planned for regular communication with each of the three finalists as the teams move ahead with their projects and prototypes.

c. If the result was not what you expected, what factors contributed to the result?

d. Is there anything you learned, that you wish you had known before running the challenge?

e. Would you run a challenge again?

Yes

5. What value did you receive from the challenge(s)?

Similar to the question above, value comes in connections that have been made between agencies and among the finalist teams. Collaboration between government agencies is not an easy process, but the benefits outnumber most any risk or downside.

6. What surprised you about the process?

The value and benefit from working with HHS. I would like to see more multi-agency challenges across the Federal government.

7. Now that you've done this, what is the level of buy-in within your organization?

a. How does this not become a one-off effort?

EPA and HHS have both developed and implemented policies and procedures for use of challenges.

b. Can this become a routinized procurement strategy?

Challenges offer the government a way to bring fresh thinking and new perspectives to complex problems. Challenges aren't the right tool for every problem we encounter, but they do serve as an efficient way to gain new ideas and new understanding with a low level of financial risk because the government only pays for successful solutions.

8. Any final comments?

Perhaps more important than the challenge or the solution is the run up to the event and the continuation after the challenge is over. In other words, spending time on problem formulation means getting all necessary clearances and buy in before the project moves ahead. Similarly, the amount of time spent on problem formulation directly influences the type and quality of solutions you'll receive. On the other hand, the end of the challenge is only the end of one phase. That communication and network of contacts that you've made throughout the year-long process become even more integral after the challenge is completed. You don't want to just stop talking with everyone – people continue to make progress, have breakthroughs. You want that line of communication open.

The Medicare Provider Portal Screening Challenge; John (Chip) Garner, CMS

1. Please describe your challenge
 - a. What was the challenge?

To develop a multi-state, multi-program information technology (IT) application to better facilitate screening providers while at the same time lowering burden on providers and reducing administrative and infrastructure expenses for States and federal programs
 - b. Why did you select a challenge to solve your problem?

Historic approaches were inflexible, time consuming, and expensive. For this particular Challenge, we chose to employ a "Crowdsourcing" model to create our set of solutions, which is a distributed problem-solving and production model. The approach would produce solutions from amateurs or volunteers working in their spare time. Through this approach, our hope was to gather large numbers of solutions or information inexpensively. The "Challenge" approach would allow us to articulate a set of goals and objectives rather than specifying a particular approach or predicting, based on a proposal, which of the multiple competing approaches would produce the best business result. In the end, we would reward only for the solution or solutions that work best against our overall goals and objectives. Thus, we are not articulating a set of specifications but are allowing those competing for the prizes to articulate the value proposition and metrics by which they are demonstrating the superiority of their solution.
 - c. What problem solving mechanisms had you already tried and for how long?

The current market for Medicaid Management Information Systems (MMIS) consists largely of system solutions that are expensive and lack the capability to incorporate new and critical business requirements due to the following factors: Inflexible Application Architectures; Isolated Application Environments; Inflexible Legacy Database Environments; No True Enterprise Data Model; No Enterprise Reporting Strategy; Non Optimally Targeted Data Warehouse Solutions; and Large Vendor's Existing Footprint on the MMIS Industry. Through this challenge, we hoped to create an application that could be re-used by multiple states and address many of the problems in the current IT environment in state Medicaid systems.
 - d. Were there other mechanisms you used to try to solve the problem first?

Traditional monolithic MMIS approaches, which only perpetuated outdated practices and did not provide the value for the cost.
 - e. What would have been the traditional method you would have used to achieve your goal?

Basic contracting approach lifecycle.
2. Describe the internal approval process for running the challenge
 - a. What did it take to gain approval?

Divine intervention. It took as long to get our challenge running as it took to execute.
 - b. How did you obtain funding?

Funding from the Partnership Fund for Program Integrity Innovation was used to fund the prizes, manage the project, provide technical assistance for implementing the solution, and integrate lessons learned into the Medicaid Information Technology Architecture (MITA). The Partnership funding also supported the evaluation of the pilot, comparing the (1) expected results or desired outcomes (2) the modeled results or outcomes from

the Challenge competition and (3) the actual results from the Phase 1 test bed.

- c. Were there any obstacles to running the challenge and how did you overcome them?
After overcoming the administrative barriers, the hardest hurdles were project management and defining scope.

3. What processes/operational procedures did you put in place to run the challenge?

Basic project management practices and execution. The Crowdsourcing vendor had a very good set of management and execution processes already in place.

- a. What resources did you use to execute? If possible, could you break it down into the following phases:

- i. Pre-Competition (e.g., problem definition and challenge design)

Internal Federal staff with some key input from our state partner, Minnesota. We also consulted with the NASA team for lessons learned and best practices.

- ii. Competition (Launch & marketing, contest/challenge support)

The Crowdsourcing vendor handled much of this for us. The crowd community was already in place. Another key was we were able to leverage the CoECI. We could not have run our Challenge without the help of the NASA team as well as it would have been impossible to execute our numerous contests without the CoECI infrastructure. Another key to our success was that the state of Minnesota partnered with CMS on the Challenge project and was not only an equal participant in all Challenge activities but also served in the role of "State Champion." Minnesota was key in helping CMS create an Advanced Planning Document (APD) template for other states to use and was an active partner in all Challenge activities, which included assisting in establishing the basic requirements for Challenge effort.

- iii. Evaluation (judging and selection of winners)

There was both an initial technical evaluation and a final sign off. Submissions for contests must meet exact, enumerated requirements and thus can be scored according to their fidelity to those requirements. For this reason initial "crowd" Review Board Reviewers can perform the evaluation of these projects, and each Reviewer completes a lengthy scorecard, and the results of all reviewers are averaged to assign a score to a submission. Submitters can then appeal their scores during an Appeals phase, which follows review. Following review, the submission with the highest score progresses to the next phase. During the technical evaluation, the Reviewers frequently identify problems that must be resolved in order for the submission to be acceptable. Any such instances are aggregated into a final single fix-list. Following the Review phase, the project enters a Final Fix and Final Review phase that allows the submitter to correct errors, and for the lead reviewer to confirm the issues have been resolved. Upon completion of the review and finalization of the scorecards by the evaluators, the scorecards were submitted to CMS judges that had been appointed by CMS to select the winner(s) of prize competitions. The judges possessed specific knowledge of the subject matter and had recognized credentials and professional experience in areas or disciplines relevant to the prize competition. CMS employed a minimum of two (2) judges to serve on the judging panel that reviewed each competition. The judges confirmed the winner of the prize competition based on a standardized assessment of the evaluation factors being used to evaluate each prize contest. All contest submissions remained anonymous. Neither the evaluators nor the judges knew the identities of the individuals that submitted their solutions

- iv. Post-Competition (Solver verification and implementation)

We are just getting underway with our pilot now.

4. Describe the outcomes of the challenge:

a. What product did you receive?

We received a number of products, including IT artifacts, code components, checklists, and a host of others.

b. What are you doing, or do you plan to do, with the result of the challenge?

We are in the process of piloting the challenge products, employing fixes if necessary, updating the documentation, and working on how we could leverage this across more states. We also have a proposal into the Partnership Fund folks to extend our current 2 technology solution stack to 3 to ensure a broader coverage of states that might be able to leverage the solution.

c. If the result was not what you expected, what factors contributed to the result?

We could have built a tighter solution had we been able to employ more Fed resources in managing the project.

d. Is there anything you learned, that you wish you had known before running the challenge?

The level of Federal project management that would have been optimal to run the project more efficiently. There is also a level of system integration that we underestimated. Had we known, we would have engaged more resources in that discipline on the project.

e. Would you run a challenge again?

Without a doubt.

5. What value did you receive from the challenge(s)?

Many lessons learned; quite a few re-usable artifacts and components; better understanding of the "crowd" and what types of projects work best; understanding of a crowdsourcing lifecycle; and a host of others.

6. What surprised you about the process?

The pace. The level of project management and system integration required to successfully execute.

7. Now that you've done this, what is the level of buy-in within your organization?

Hard to say because of the hurdles that I encountered from an administrative standpoint. Also, folks are more comfortable handling things over completely to a single contractor that does everything for them. For a crowdsourcing effort to succeed, the organization needs both a dedicated project manager and a contribution from some system engineering folk.

a. How does this not become a one-off effort?

Need to remove some of the obstacles we've documented as well as ensure folks know when to use a crowdsourcing type of effort and for which projects it is best suited.

b. Can this become a routinized procurement strategy?

Yes, but would need a focused effort from some folks that have lived the lifecycle as well as assistance from senior leadership to help foster adoption.

8. Any final comments?

This was a great and highly informative project. The value earned from the project far surpassed the cost.

The Tech Challenge for Atrocity Prevention; Maurice Kent and Mark Goldenbaum, USAID

1. Please describe your challenge
 - a. What was the challenge?
USAID and Humanity United's Tech Challenge for Atrocity Prevention
 - b. Why did you select a challenge to solve your problem?
Desire to generate innovation in the atrocity prevention field through an open process. This is an extremely intractable issue, and bringing additional eyes/brains to it could generate unexpected solutions.
 - c. What problem solving mechanisms had you already tried and for how long?
I am not aware of any (not an area technical expert).
 - d. Were there other mechanisms you used to try to solve the problem first?
Not that I am aware of (not an area technical expert)
 - e. What would have been the traditional method you would have used to achieve your goal?
grant to larger traditional implementer
2. Describe the internal approval process for running the challenge
 - a. What did it take to gain approval?
The concept received high-level commitment in the form of the atrocity prevention board very early in the process
 - b. How did you obtain funding?
combination of funds from existing/traditional human rights programs and a general pool of science/technology funds.
 - c. Were there any obstacles to running the challenge and how did you overcome them?
Identifying the mechanism to actually obtain a challenge provider. Having space to explore different avenues and not be completely driven by deadlines was important.
3. What processes/operational procedures did you put in place to run the challenge?
 - a. What resources did you use to execute? If possible, could you break it down into the following phases:
 - i. Pre-Competition (e.g., problem definition and challenge design)
USAID & HU staff, contract staff, internal and external experts
 - ii. Competition (Launch & marketing, contest/challenge support)
USAID, NASA and HU staff/networks, contracted comms groups (via HU), implementing partner networks
 - iii. Evaluation (judging and selection of winners)
USAID and HU staff, external judges

iv. Post-Competition (Solver verification and implementation)
USAID staff

4. Describe the outcomes of the challenge:

a. What product did you receive?

combination of concepts and prototypes

b. What are you doing, or do you plan to do, with the result of the challenge?

incorporate some ideas into our programming, connect others with potential users, build the broader pool of innovation for atrocity prevention.

c. If the result was not what you expected, what factors contributed to the result?

The importance of being specific and not "jargony" in the challenge statement. We learned in running the second set of challenges to be more thoughtful and deliberate with that process. The importance of doing our own outreach and knowing we did everything we could made a difference on the second round of challenges.

d. Would you run a challenge again?

yes. Important to find the right issue. This was an exciting process and a refreshing process.

5. What value did you receive from the challenge(s)?

Interest in/validation for innovation in atrocity prevention, some truly intriguing ideas, good connections to new thinkers eager to work with us. Additionally: we were able to get outside our usual group. We were having a hard time getting fresh ideas because of existing financial relationships. Getting this honest feedback was a breakthrough. The ideas haven't turned out to be fundamental breakthroughs, but using prizes as a way to get fresh ideas was a process breakthrough and very exciting. Another value came in the form of the thinking we needed to do. When we think about technology and human rights we need to the greatest extent possible put ourselves in the shoes of the engineers and developers. We need to try and be as technical as possible. The more specs we can offer the better the result. We need to think not at the conceptual level, but at the product level.

6. What surprised you about the process?

The breadth of thinking on the subject; Realizing that you get out of it what you put into it. We were initially a little naïve thinking that we would set it in motion and that innovation would magically appear.

7. Now that you've done this, what is the level of buy-in within your organization?
There's like this irrational buy in. People are so excited about science, technology, and innovation. There's excitement around these tools and tons of buy in. It's a little bit "all the rage."
- a. How does this not become a one-off effort?
may not run another challenge in this field, but there is strong buy in for the focus on innovation in atrocity prevention
 - b. Can this become a routinized procurement strategy?
model is replicable, but might consider direct procurement rather than via COECI.
Open to using in specific circumstances. As a small organization we have to be choosy about how we allocate human resources.
8. Any final comments?